CLAIMS

What is claimed is:

1. A circuit, comprising:

a capacitor coupled to be alternatingly charged and discharged by first and second current sources;

a first voltage follower circuit including a first bipolar transistor having a base coupled to the capacitor, the first bipolar transistor biased such that a voltage at an emitter of the first bipolar transistor follows a voltage on the capacitor; and

a current mirror having first and second current paths, the first current path coupled to the base of the first bipolar transistor, the first current path providing substantially all of a base current received by the base of the first bipolar transistor.

2. The circuit of claim 1 wherein the base current received by the base of the first bipolar transistor includes substantially zero current received from the capacitor.

3. The circuit of claim 1 further comprising a second voltage follower circuit including a second bipolar transistor having a base coupled to the second current path, the second current path providing substantially all of a base current received by the base of the second bipolar transistor.

4. The circuit of claim 3 wherein the first and second bipolar transistors are substantially matched in current density.

5. The circuit of claim 3 further comprising first and second bias current sources, the first bias current source coupled to the emitter of the first bipolar transistor and the second bias current source coupled to an emitter of the second bipolar transistor.

6. The circuit of claim 1 further comprising a switch coupled between the second current source and the capacitor, the switched coupled to be alternatingly opened and closed such that when the switch is opened, the first current source is coupled to charge the capacitor and when the switch is closed, the first and second current sources are coupled to discharge the capacitor.

7. The circuit of claim 6 wherein the switch is coupled to be opened until the voltage on the capacitor is charged to a first threshold and wherein the switch is coupled to be closed until the voltage on the capacitor is discharged to a second threshold.

8. The circuit of claim 7 further comprising a comparator coupled to receive the voltage at the emitter of the first bipolar transistor, an output of the comparator coupled to control the switch.

9. The circuit of claim 1 wherein a ratio of currents provided by the first and second current sources is substantially fixed to provide a substantially fixed duty ratio of an oscillating voltage provided on the capacitor.

10. The circuit of claim 1 wherein a ratio of currents provided by the first and second current sources is variable to adjust a duty ratio of an oscillating voltage provided on the capacitor.

11. The circuit of claim 1 wherein magnitudes of currents provided by the first and second current sources are substantially fixed to provide a substantially fixed frequency of an oscillating voltage provided on the capacitor

12. The circuit of claim 1 wherein magnitudes of currents provided by the first and second current sources are variable to adjust a frequency of an oscillating voltage provided on the capacitor.

13. An integrated circuit, comprising:

a capacitor coupled to a first current source and to a switch, the switch coupled to a second current source, a magnitude and a direction of the first current source and the second current source causing a voltage on the capacitor to change in one direction when the switch is open and to change in an opposite direction when the switch is closed;

a voltage follower circuit including an input coupled to the capacitor;

a comparator circuit having an input coupled to an output of the voltage follower circuit, an output of the comparator circuit coupled to the switch such that the switch is opened when the voltage on the capacitor reaches a first threshold and the switch is closed when the voltage on the capacitor reaches a second threshold;

a first bipolar transistor included in the voltage follower circuit, the first bipolar transistor having an emitter coupled to a third current source, a base of the first bipolar transistor coupled to the capacitor;

a second bipolar transistor substantially the same as the first bipolar transistor, an emitter of the second bipolar transistor coupled to a fourth current source, the fourth current source substantially the same as the third current source; and

a current mirror circuit coupled to a base of the second bipolar transistor such that an output current of the current mirror circuit is substantially equal to a base current of the second bipolar transistor, the output current of the current mirror circuit coupled to the base of the first bipolar transistor.

14. The integrated circuit of claim 13 wherein the integrated circuit is included in a controller in a switching power supply.

15. The integrated circuit of claim 13 wherein the magnitude of the first current source and the magnitude of the second current source are substantially constant while the voltage on the capacitor is changing.

16. The integrated circuit of claim 13 wherein the magnitude of the first current source and the magnitude of the second current source are proportional with a ratio that is substantially constant while the voltage on the capacitor is changing.

17. The integrated circuit of claim 13 wherein the magnitude of the first current source and the magnitude of the second current source are variable.

18. An integrated circuit oscillator comprising

a capacitor coupled to a first current source and a second current source, magnitudes and directions of the first current source and the second current source, respectively, causing a voltage on the capacitor to change in one direction until the voltage on the capacitor reaches a first threshold and to change in the opposite direction when the voltage on the capacitor reaches a second threshold;

a first bipolar transistor having a base coupled to the capacitor;

a second bipolar transistor having a current density substantially equal to a current density of the first bipolar transistor;

a current mirror circuit coupled to a base of the second bipolar transistor, the current mirror circuit having an output substantially proportional to a base current of the second bipolar transistor, wherein the output of the current mirror circuit is substantially equal to a base current of the first bipolar transistor, wherein the output of the current mirror circuit is coupled to the base of the first bipolar transistor.

19. The integrated circuit of claim 18 wherein the integrated circuit is included in a controller in a switching power supply.

20. The integrated circuit of claim 18 wherein the magnitude of the first current source and the magnitude of the second current source are substantially constant while the voltage on the capacitor is changing.

21. The integrated circuit of claim 18 wherein the magnitude of the first current source and the magnitude of the second current source are proportional with a ratio that is substantially constant while the voltage on the capacitor is changing.

22. The integrated circuit of claim 18 wherein the magnitude of the first current source and the magnitude of the second current source are variable.